

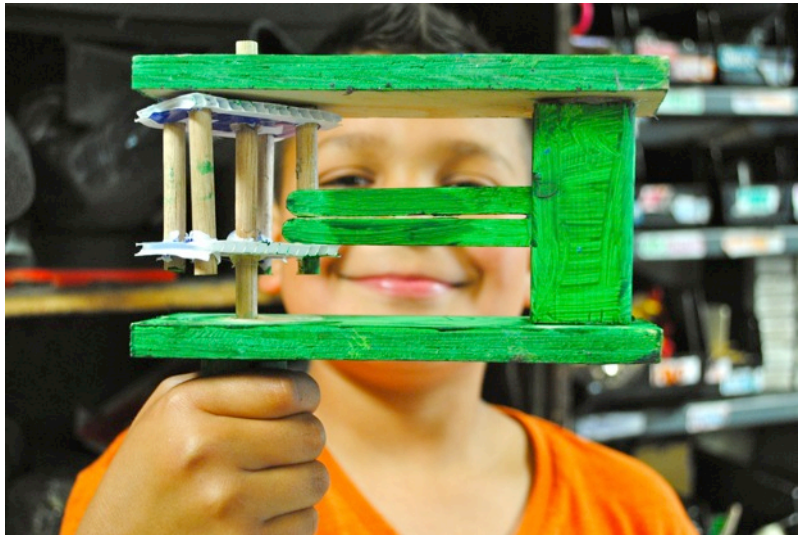
# Matraca

**Category:** Physics: Sound & Waves

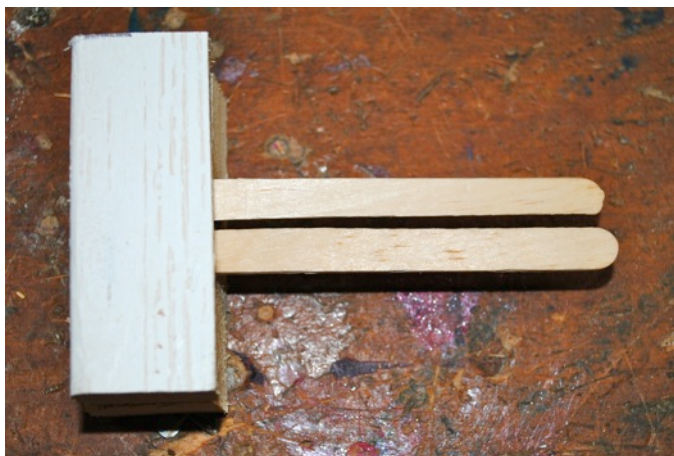
**Type:** Make & Take

**Rough Parts List:**

3	Wood pieces, 1" x 2" x 3" long
2	Craft sticks
9"	Dowel, 5/16"
2	Wood pieces, at least 7" long
	Cardboard, or corrugated plastic
	Tape, black or masking
	Glue gun



**How To:**



Glue 2 craft sticks between 2-1" x 2" x 3" wood blocks.

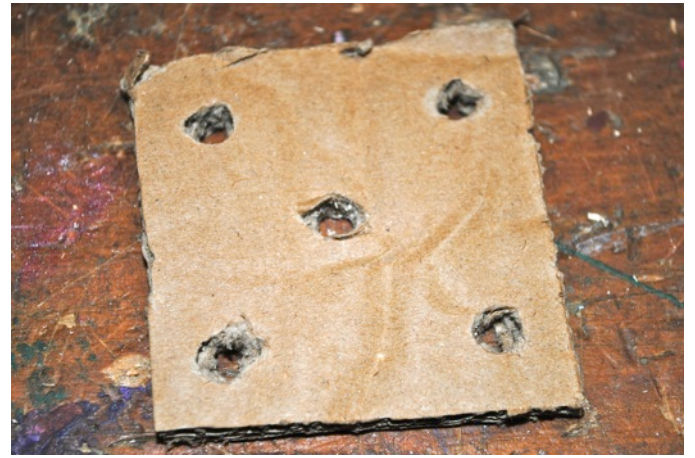


Cut 4 dowels into 2.5" pieces.

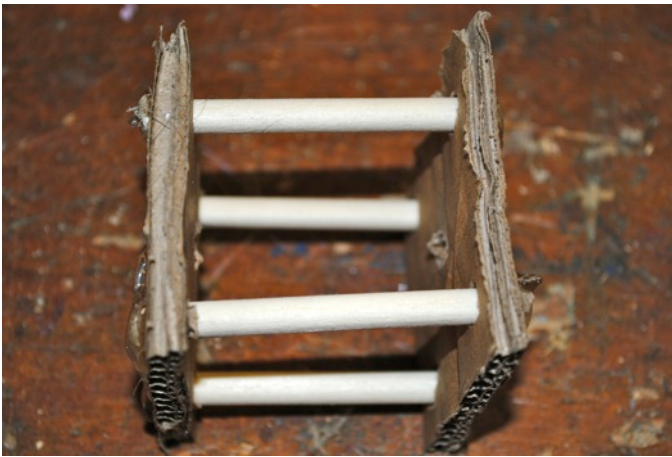




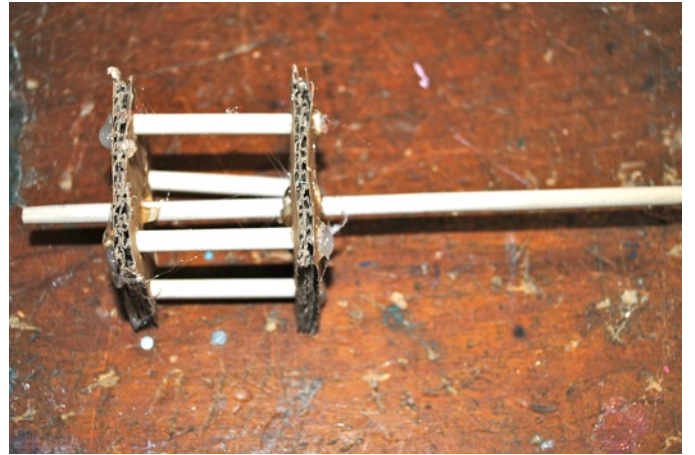
Cut 2- 2.5" x 2.5" squares.



Drill holes in 4 corners and center of each square.



Cut four dowels 2.5" long and stick one in each corner hole to connect the squares. They can't stick out much on the ends.



Insert the remainder of the dowel through center of cube. Glue all dowel-cardboard joints tightly.

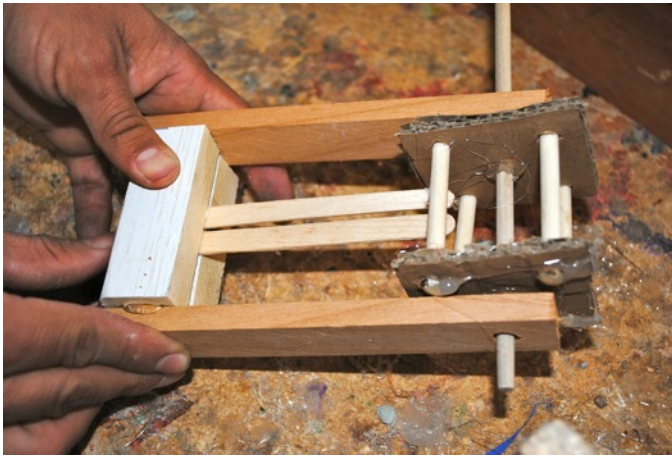


Drill a 3/8" hole at one end of each 7" piece of wood.



Slide the long dowel through these two holes.





Glue the craft stick block so that the sticks are about halfway past the short dowels toward the center dowel.



Wrap tape around the glued end for added strength.



Drill a  $\frac{19}{64}$ " hole in the remaining 1x2 and hammer dowel in to attach the handle.



Make sure it is all aligned correctly.



Spin the matraca!

## Fine Points:

- The center dowel must be glued tightly to the cardboard squares and the handle.
- If the popsicle sticks don't make enough noise, it may be necessary to move them inward toward the center dowel.

## Concepts Involved:

- Most musical instruments (trumpets, flutes, clarinets, whistles) make sound primarily at one frequency at a time.
- Some instruments (pianos, guitars, harps, organs) make several frequencies at once that sound good together.
- Even most percussion instruments (marimba, cow bell, bass drum, timpani) are tuned to make sound at a given frequency or small set of frequencies.
- Some percussion instruments like the matraca, however, make a wide range of frequencies all at once, just like clapping your hands.

## Elaboration:

Sound is vibration that you can hear. A vibration has a certain frequency, and most musical instruments try to achieve a nice combination of frequencies to give a pleasant sound. Other machines, like symbols and matraca, just make noise. Noise is sound at a lot of frequencies all at the same time. When you hear it, you can't hear any certain frequency. This noise can come in short bursts, like clapping your hands or hitting the symbol. Other noise keeps on going, like the sound of the ocean or static on the radio. At a big game, people want to make a lot of noise and it doesn't matter so much if it sounds nice or what frequency it is.

For a given musical instrument, you can always ask what is vibrating. In the matraca, the sticks hit the dowels and they all vibrate very shortly. This is the click. The other sticks on the matraca act like sounding boards to increase the volume.

## Focus Questions:

1. What could you do to make the matraca louder?
2. What would happen if you made the matraca three times as large?
3. How could you make a matraca that gives sound at only one frequency?
4. What would happen if you put a stiffer piece of wood to hit the dowels on the matraca?

## **Links to k-12 CA Content Standards:**

### **Grades k-8 Standard Set Investigation and Experimentation**

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other strands, students should develop their own questions and perform investigations.

### **Grades k-12 Mathematical Reasoning:**

1.0 Students make decisions about how to approach problems:

1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.

1.2 Determine when and how to break a problem into simpler parts.

2.0 Students use strategies, skills, and concepts in finding solutions:

2.1 Use estimation to verify the reasonableness of calculated results.

2.2 Apply strategies and results from simpler problems to more complex problems.

2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

2.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

3.0 Students move beyond a particular problem by generalizing to other situations:

3.1 Evaluate the reasonableness of the solution in the context of the original situation.

3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.

3.3 Develop generalizations of the results obtained and apply them in other circumstances.

### **Grade 2 Standard Set 1: Physical Sciences**

The motion of objects can be observed and measured.

1.g. Students know sound is made by vibrating objects and can be described by its pitch and volume.

### **Grade 3 Standard Set 1. Physical Sciences (Energy & Matter):**

1.d Students know energy can be carried from one place to another by waves, such as water waves and sound waves, by electric current, and by moving objects.